

## EFFECT OF NITROGEN SOURCES AND THEIR LEVEL FOR GROWTH, YIELD AND QUALITY OF GUAVA (*Psidiumguajava* L)

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### ABSTRACT

*The experiment was undertaken during 2012 and 2013, to study the effect of sources of nitrogen and their level of growth, yield and quality of winter guava fruit. The vegetative parameters increased, with increasing doses of nitrogen and maximum percent increase in plant height (17.08 %), shoot length (64.71 cm), tree girth (7.24 %), plant spread (15.15 %) and leaf area (132.59 cm<sup>2</sup>) were obtained, when urea applied @ 800 g/plant. The maximum fruit yield and fruit yield efficiency was recorded (53.99) kg/plant and (6.04) kg/plant, respectively, when CAN apply @ 600 g/plant. The maximum TSS (11.55° B), ascorbic acid (260.79 mg/100g of pulp) and total sugar (7.58 %), were found with the application of CAN @ 600 g/plant.*

**KEYWORDS:** Urea, Calcium Ammonium Nitrate (CAN), Level, Yield & Quality

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### INTRODUCTION

Guava (*Psidiumguajava*L) belongs to the family of Myrtaceae and native to tropical America. It is being grown commercially in the tropics, as well as subtropical parts of all over the world. As an important crop of India, it has gained considerable prominence on account of its high nutritive value, availability of moderate price, a pleasant aroma and good flavour, so that, it is called as 'apple of tropics'. Nutrients are essential for the productivity and quality of guava fruits. Hence, determination of nutritional needs for efficient production of high quality fruits is an important aspect of nutrient management, for the orchardists. Nitrogen imparts vigorous vegetative growth and essentials, for carbohydrate utilization within plants. The experiment was formulated, to assess the sources of nitrogen and their level of growth, yield and quality of guava.

### MATERIALS AND METHODS

The investigations were carried out at the Bihar Agricultural College, Sabour, Bhagalpur, during the winter season of the year 2012 and 2013. The experiment was conducted on nine years old plants of guava cv. 'Allahabad Safeda', during winter season. Sabour is situated under subtropical zone, between 25° 15' 40" north latitudes and 87° 12' 42" east longitudes, at an altitude of 45.72 meters, above mean sea level. It has a semi-arid, subtropical climate with hot desiccating summer, cold, but frostless winter with an average rainfall about 1040 mm. The soil of an orchard is loam, deep and well drained. The fertility status of the soil was ascertained by its chemical analysis. Nitrogen sources were used from urea and calcium ammonium nitrate (CAN) and their levels of nitrogen applied (a.i) @ 400, 600 & 800 g/plant. Phosphorous and potassium applied uniformly in all the treatments. The 2/3<sup>rd</sup> and 1/3<sup>rd</sup> dose of nitrogen applied during the last week of June and September, respectively. The experiment was laid out in Randomized Block Design (Factorial), replicated thrice. The height of the tree was measured in meter from

the ground surface to top of the tree, with the help of a scaled bamboo pole. New vegetative shoots of individual branch, in all the directions, i.e., East, West and North- South were tagged and measured, with the help of measuring tape. The yield of fruits per plant was recorded by weighing the harvested fruits, in different pickings. Fruits yield efficiency was recorded, by weighing fruits in a square meter in different pickings. The total soluble solids of the fruit juice were estimated with the help of a hand refractometer and expressed as °B. Ascorbic acid in guava determined and titrated against 2, 6-dichlorophenol indophenol dye solution, to a faint pink end point which persisted for 15 seconds (A. O. A. C., 1984). The vitamin C content of the fruit was expressed as milligrams of ascorbic acid, per 100 g of pulp. Total sugars were determined by the method of Lane and Eyon (1923).

## RESULTS AND DISCUSSION

Sources of Nitrogen and its level of application to guava plant showed beneficial effect on vegetative growth parameters. Perusal of data presented in Table-1 indicated that, plant height, length of shoots, plant girth and the plant spread increased with increasing levels of nitrogen. Significantly, maximum plant height (17.08 %), shoot length (64.71 cm), tree girth (7.24 %) and a plant spread (15.15 %) was recorded with the application of 800 g Nitrogen /plant. The effect of doses of urea was more pronounced, compared to calcium ammonium nitrate on vegetative growth parameters. Minimum plant height, shoot length, tree girth and plant spread were recorded under nitrogen applied @ 400 g/plant. It was observed that, increasing levels of nitrogen increased the vegetative parameters in a progressive manner. Similar findings were reported by Pathak and Ram (2005), Singh *et al* (2001), and Aseri *et al* (2008).

**Table 1: Effect of Nitrogen and its Levels on Vegetative Parameters of Guava Plant (Pooled Data Two Years)**

Doses of Nitrogen	% Increase in Plant Height	Length of Shoots (cm)	% Increase in Plant Girth	% Increases in Plant Spread
Nitrogen @ 400 g/plant	9.01	42.74	6.75	8.78
Nitrogen @ 600 g/plant	14.70	53.95	6.97	12.72
Nitrogen @ 800 g/plant	17.08	64.71	7.24	15.15
SE $\pm$ m	0.07	0.36	0.04	0.09
C D at 5%	0.22	1.04	0.13	0.25

**Table 2: Effect of Sources of Nitrogen on Vegetative Parameters of Guava (Pooled Data Two Years)**

Effect of Sources Nitrogen	% Increase in Plant Height	Length of Shoots (cm)	% Increase in Plant Girth	% Increases in Plant Spread
Urea	13.86	55.35	7.05	12.35
Calcium nitrate	13.33	52.25	6.92	12.08
SE $\pm$ m	0.09		0.05	0.10
C D at 5%	0.26	NS	0.15	0.28

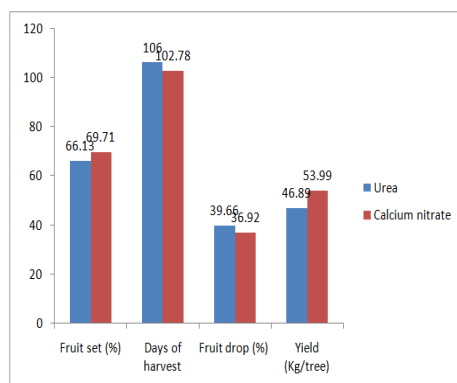
The data pertaining to sources of nitrogen, compared among Urea and Calcium Ammonium Nitrate (CAN) in Table-2. The data clearly revealed that, Urea is having a more pronounced effect on vegetative parameter. Maximum plant height (13.86 %), length of shoots (55.35 cm) plant girth (7.05 %) and a plant spread (12.35 %) was observed, in urea than CAN. Application of fertilizer through urea is more readily available to the plant. The results of the present study are in accordance with Pathak and Ram, 2005. They observed improvement of vegetative growth parameters in guava, with the application of different fertilizers. The percent increase in tree height, spread, shoot length and leaf area could be attributed to increased nutrient availability and hence, vigorous plant growth is attained. Singh *et al* 2001 and Aseri *et al* 2006

**Table 3: Effect of Nitrogen and its Levels on Yield Contributing Parameters of Guava Plant (Pooled Data Two Year)**

Doses of Nitrogen	Fruit Set (%)	Days of Harvest /Maturity	Fruit Drop (%)	Yield (Kg/Plant)
Nitrogen @ 400 g/plant	66.52(54.73)	108.92	41.22	43.14
Nitrogen @ 600 g/plant	70.46(57.20)	103.14	39.21	52.89
Nitrogen @ 800 g/plant	69.77(56.79)	102.61	37.43	47.78
SE $\pm$ m	0.25	2.01	0.18	0.35
C D at 5%	0.70	0.71	0.52	0.99

Perusal of data from Table: -3 showed that, Nitrogen has a significant effect on fruit set percent, days of harvesting; fruit drop percent and yield. Significantly, higher yield (52.89 kg/plant) and fruit set (70.46 %) were obtained, when nitrogen was applied @ 600 g/plant. Whereas, least number of days for harvesting, i.e., 102.61 days and minimum fruit drop (37.43 %) were noticed, when nitrogen was applied @ 800 g/plant, which is statistically similar with application of nitrogen @ 600 g/plant. The number of days for harvesting reduces by one week. Soil application of Nitrogen leads to early flowering might be, due to synthesis of nucleic acid, which in turn influenced the formation of flower bud primordial, advanced the completion of physiological process involved in blossoming. The results of present finding are in support with Amitkumar Goswami et al., 2012 and Akashsharma et al., 2013

The graph, 1 pertaining to fruit yield and fruit yield efficiency was depicted. It indicated that, fruit yield increased with enhancing doses of nitrogen from its sources. Significantly, maximum fruit yield (53.99 kg/plant), fruit set (69.71 %) and fruit yield efficiency (6.01 kg/ m<sup>2</sup>), least number of days (102.78 days) and fruit drop (36.92 %) were recorded, due to application of CAN @ 600 g/plant, which was followed by application of urea @ 600 g/plant. A 20.70 % increase in fruit yield, over the lowest dose of nitrogen (urea @ 400 g/plant). In terms of yield, calcium ammonium nitrate gave better results than urea. The above results are in accordance with the finding of Athani et al (2009) and Dinesh Kumar et al (2009).

**Graph 1: Effect of Sources of Nitrogen on Reproductive Parameters of Guava (Pooled Data Two Years)****Table 4: Effect of Nitrogen and its Levels of Quality Contributing Parameters of Guava Plant (Pooled Data Two Years)**

Effect of Nitrogen	TSS ( <sup>o</sup> B )	Ascorbic Acid (mg/100 g of Pulp)	Total Sugar (%)
Nitrogen @ 400 g/plant	10.07	233.76	6.00
Nitrogen @ 600 g/plant	11.55	260.79	7.58
Nitrogen @ 800 g/plant	11.17	261.64	7.21
SE $\pm$ m	0.06	1.15	0.03
C D at 5%	0.19	3.24	0.09

The data pertaining to fruit quality characters, as influenced by nitrogen and its level have been presented in Table -4. The TSS, ascorbic acid and total sugar increased, with increasing levels of nitrogen from 400 g to 800 g /tree, being the maximum with the application of 600g nitrogen/tree. Significantly, maximum TSS (11.55<sup>0</sup> B), ascorbic acid (260.79 mg/100 g of pulp) and total sugar (7.58 %) were found, with nitrogen @ 600 g/plant. However, minimum TSS, ascorbic acid and total sugar were observed, when nitrogen applied @ 400 g/plant.

**Table 5: Effect of Sources of Nitrogen on Quality Contributing Parameters of Guava Plant (Pooled Data Two Years)**

Effect of Sources Nitrogen	T S S (* Brix)	Ascorbic Acid (mg /100 g of Pulp)	Total Sugar (%)
Urea	10.83	247.23	6.78
Calcium nitrate	12.02	256.90	8.08
SE $\pm$ m	----	1.31	0.03
C D at 5%	NS	3.71	0.10

Perusal of data on fruit quality characters, as influenced by sources of nitrogen have been presented in Table -5. The TSS, ascorbic acid and total sugar increased with sources of nitrogen, from 400 g to 800 g /plant, being the maximum with the application of 600 g calcium nitrate /plant. Significantly, maximum TSS (12.02\* B), ascorbic acid (256.90 mg/100 g of pulp) and total sugar (8.08 %) were found with CAN @ 600 g/plant. However, minimum TSS, ascorbic acid and total sugar were observed, when Urea applied @ 400 g/plant. The effect of doses of calcium ammonium nitrate on yield contributing characters and quality parameters was more pronounced compared to urea. The findings are in conformity with Hundal *et al* (2007), Hari *et al* (2008) and Kumar *et al* (2009).

## CONCLUSIONS

Application of Urea @ 800 g/plant had a more pronounced effect on vegetative growth, rather than reproductive parameters. From the above depicted table and graph, it is found that, the calcium nitrate @ 600 g/plant is the best for improving yield contributing character, as well as yield and quality attributes of guava fruits.

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